

Model Inversion, Phase I

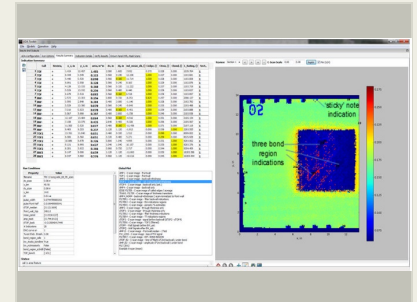
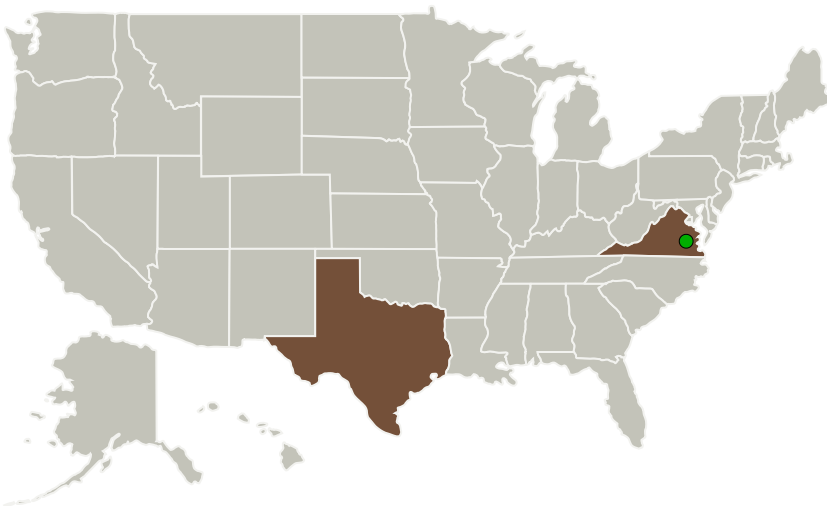
Completed Technology Project (2017 - 2017)



Project Introduction

Forward and inverse modeling of nondestructive evaluation (NDE) are key needs for optimized, quantitative NDE. Some forward modeling tools exist commercially, but inverse modeling remains a topic mostly in low TRL research. The ill-posed nature of the problem in general requires data-driven methods that are computationally intensive and highly problem specific. We propose two innovations to provide significant improvement to inversion: First, modern classifier-based data reduction, to prepare data for the second innovation, Kriging methods for a generalized NDE inversion approach. Experimental data and/or modeled data can be used to define known points in a multi-dimensional solution space, and Kriging methods can provide efficient interpolation in this space to invert new NDE data. TRI/Austin, AeroMatter, and Computational Tools are teaming to develop and demonstrate inversion of ultrasonic NDE on composite structures for quantitative damage assessment. The proposed innovations to be provided are: 1. Combined use of experiment and model data for developing the known solution points. 2. Dimensional reduction of the data for efficient inversion using state of the art classifier techniques. 3. Kriging methods for interpolation of new NDE data in the solution space. 4. High performance computing (HPC) technologies to speed data reduction and Kriging results. The significance of the innovations are that this approach offers an ability to invert NDE data using known or truth data from experiment and/or models, and is readily adapted to high performance computing technologies for practical use. The NDEInverter will work with the rest of the tools in TRI/Austin's NDEToolbox. NDEToolbox serves as a foundational, evolving platform for the management and analysis of NDE data, interaction with NDE models, and risk / reliability prediction.

Primary U.S. Work Locations and Key Partners



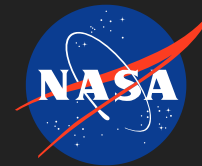
Model Inversion, Phase I
Briefing Chart Image

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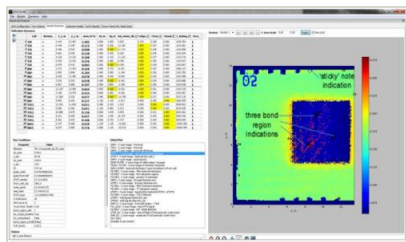


Organizations Performing Work	Role	Type	Location
Texas Research Institute Austin, Inc.	Lead Organization	Industry	Austin, Texas
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations

Texas	Virginia
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Images



Briefing Chart Image

Model Inversion, Phase I Briefing Chart Image
 (<https://techport.nasa.gov/image/127467>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Texas Research Institute Austin, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

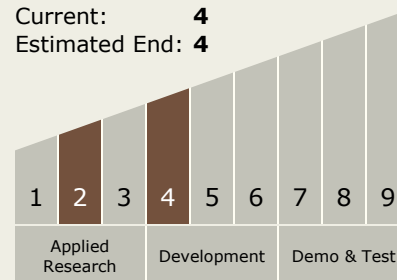
David S Forsyth

Technology Maturity (TRL)

Start: 2

Current: 4

Estimated End: 4



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Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - └ TX12.4 Manufacturing
 - └ TX12.4.5 Nondestructive Evaluation and Sensors

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System